

Hantavirus

(Also known as Hantavirus Pulmonary Syndrome and Hantavirus Disease)

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Hantaviruses are agents for several syndromes, but only one disease is naturally occurring in the United States. Several different hantavirus species exist, each associated primarily with a single rodent species. One disease caused by hantaviruses is hemorrhagic fever with renal syndrome (HRFS). The disease occurs mainly in rural areas of Asia and the Balkans and is caused by Hantaan virus. The Puumala virus causes milder HFRS in Europe. Seoul virus, which is widely distributed, also causes HFRS of variable severity.

Hantavirus pulmonary syndrome (HPS) occurs in the US. There are several hantaviruses associated with HPS. Sin Nombre virus (SNV) is the agent responsible for the 1993 HPS epidemic in the Southwest. Black Creek Canal virus was implicated in a single HPS case in Florida. Bayou virus was discovered from cases in Louisiana and Texas. New York-1 virus is similar to SNV, but it is distinct enough to suggest that it is a variant found in the eastern third of the US. Most cases of HPS have been associated with the Sin Nombre virus.

B. Clinical Description

HPS is an acute febrile illness that progresses rapidly to severe respiratory failure (acute respiratory distress syndrome or ARDS) and shock. Clinical findings during the 3 to 5 day prodrome are nonspecific flu-like symptoms, including fever, fatigue, and muscle aches, especially in the large muscle groups. Gastrointestinal manifestations or dizziness may also accompany these symptoms. As the disease progresses, symptoms can include cough and shortness of breath as the lungs fill with fluid. Once the cardiopulmonary phase begins, the disease progresses rapidly, necessitating hospitalization and often assisted ventilation within 24 hours. Renal failure and hemorrhagic manifestations, common in HRFS, have been mild or absent in most recognized cases of HPS. The mortality rate is still not well defined but appears to be approximately 40–50%. In survivors, recovery from the acute illness is rapid with apparent restoration of normal lung function.

C. Reservoirs

The main reservoir for Sin Nombre virus is the deer mouse, *Peromyscus maniculatus*, native to most of the United States. Black Creek Canal virus is associated with the cotton rat, *Sigmodon hispidus*, found in the Southeast. The rice rat, *Oryzomys palustris*, found in the southern United States, acts as a reservoir for Bayou virus. In the northeastern states, both the white-footed deer mouse, *Peromyscus leucopus*, and the deer mouse have been associated with New York-1.

D. Modes of Transmission

Infected rodents shed live virus in their saliva, feces and urine. Humans are infected when they inhale dust that contains dried contaminated rodent urine or feces. Transmission may also occur when dried materials contaminated by rodent feces or urine are disturbed and are directly introduced into broken skin or the eyes, nose or mouth. There is no evidence of person-to-person transmission of HPS in the United States.

E. Incubation Period

Since HPS is relatively uncommon, the incubation period has not yet been well defined, but it is believed to range from about 1 to 6 weeks after exposure, with a average of about 2 weeks.

F. Period of Communicability or Infectious Period

There has been no evidence of person-to-person spread of this disease in the United States.

G. Epidemiology

HPS was first recognized in 1993; approximately 225 cases have been identified in the US as of September 1999. Cases have been reported in 30 states, including most of the western half of the country and some eastern

states as well. About 75% of patients with HPS have been residents of rural areas. The distribution of identified cases reflects a spring-summer peak seasonality, although cases have occurred throughout the year. Cases of HPS have also been reported in Canada and in several countries in South America. Any person whose occupational activities (biologists, pest-control workers, etc.) or recreational activities (hikers, campers, etc.) put them in frequent contact with rodents or their droppings is potentially at risk of disease. Disturbing or inhabiting closed, actively rodent-infested structures is an important risk factor for contracting HPS.

2) REPORTING CRITERIA AND LABORATORY TESTING SERVICES

A. What to Report to the Massachusetts Department of Public Health

- Report any suspect case of hantavirus based on a healthcare provider's medical diagnosis. *Note:* See Section 3) C below for information on how to report a case.

B. Laboratory Testing Services Available

The Massachusetts State Laboratory Institute (SLI), Viral Serology Laboratory should receive all specimens of suspected hantavirus along with a complete case history. The Viral Serology Laboratory does not perform the testing but forwards samples to the Centers for Disease Control and Prevention (CDC). Contact the Viral Serology Laboratory at (617) 983-6396 for information on submitting samples and approval for testing.

3) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To assess the magnitude of the disease in different areas and among different risk groups.
- To identify outbreaks as soon as possible.
- To identify rodent sources of infection.
- To monitor the emergence of HPS in new areas and new risk groups.
- To design more effective control or prevention methods.

B. Laboratory and Healthcare Provider Reporting Requirements

The Massachusetts Department of Public Health (MDPH) requests that healthcare providers report to the local board of health in the community where diagnosed all suspect and known cases of hantavirus infection. A case of hantavirus infection is defined by the reporting criteria in Section 2) A above. Please refer to the lists of reportable diseases (at the end of this manual's introductory section) for information.

C. Local Board of Health Reporting and Follow-Up Responsibilities

1. Reporting Requirements

The MDPH requests that each local board of health (LBOH) report any suspect or known case of hantavirus disease, as defined by the reporting criteria in Section 2) A, to the MDPH Division of Epidemiology and Immunization, Surveillance Program using an official MDPH *Generic Disease Reporting Form* (in Appendix A). Refer to the *Local Board of Health Reporting Timeline* (at the end of this manual's introductory section) for information on prioritization and timeliness requirements of reporting and case investigation.

2. Case Investigation

- a. Case investigation of hantavirus disease in Massachusetts residents will be directed by the MDPH Division of Epidemiology and Immunization.
- b. Following notification of the MDPH, the LBOH(s) may be asked to assist in completing an official MDPH *Generic Disease Reporting Form* (in Appendix A) by interviewing the case and others who may be able to provide pertinent information. Most of the information required on the form can be obtained from the healthcare provider or the medical record. Use the following guidelines to assist you in completing the form:
 - 1) Record "Hantavirus Disease" (or "Hantavirus Pulmonary Syndrome") as the disease being reported.
 - 2) Record the case's demographic information.

- 3) Record the date of symptom onset, symptoms, date of diagnosis, hospitalization information (if applicable), and outcome of disease (*e.g.*, recovered, died).
 - 4) Exposure history: use the approximate incubation period range for hantavirus (1-6 weeks). Specifically, focus on the period beginning about 1 week prior to the case's onset date back to approximately 6 weeks before onset for the following exposures:
 - a) Travel history: determine the date(s) and geographic area(s) visited by the case.
 - b) Rodent contact: ask the case about potential direct or indirect occupational or recreational exposure to rodents and/or rodent droppings. Document in the "Comments" section.
 - 5) Complete the import status section to indicate where hantavirus was acquired. If unsure, check "Unknown." Include any additional comments regarding the case.
 - 6) If you have made several attempts to obtain case information, but have been unsuccessful (*e.g.*, the case or healthcare provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason why it could not be filled out completely.
- c. After completing the form, attach lab report(s) and mail (in an envelope marked "Confidential") to the MDPH Division of Epidemiology and Immunization, Surveillance Program. The mailing address is:
MDPH, Division of Epidemiology and Immunization
Surveillance Program, Room 241
305 South Street
Jamaica Plain, MA 02130
- d. Institution of disease control measures is an integral part of case investigation. It is the LBOH responsibility to understand, and, if necessary, institute the control guidelines listed below.

4) CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (105 CMR 300.200)

None.

B. Protection of Contacts of a Case

None.

C. Managing Special Situations

Reported Incidence Is Higher Than Usual/Outbreak Suspected

If any cases of hantavirus infection are reported in your city/town or if you suspect an outbreak, investigate to determine the source of infection and mode of transmission. Consult with the epidemiologist on-call at the Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850. The Division can help determine a course of action to prevent further cases and can perform surveillance for cases that may cross several town lines and therefore be difficult to identify at a local level.

D. Preventive Measures

Environmental Measures

The best way to prevent HPS is to eliminate or minimize human contact with rodents.

- Clear brush, grass, and garbage from around building foundations to eliminate a source of nesting materials. Keep tight-fitting lids on all garbage.
- Use metal flashing around the base of wooden, earthen or adobe dwellings to provide a strong metal barrier.
- Seal all entry holes ¼ inch wide or wider with lath screen or lath metal, cement, wire screening or other patching materials, inside and out.
- Elevate hay, woodpiles and garbage cans to eliminate possible nesting sites.
- Use an EPA-approved rodenticide with bait under plywood or plastic shelter along baseboards, or trap and properly dispose of rodents. Live trapping of rodents is not recommended.

- Clean all food preparation areas. Store all food (both human and pet) in rodent-proof containers.
- Do not leave open bowls of pet food outside. Discard any uneaten pet food properly at the end of the day.

Personal Preventive Measures

People involved in cleaning rodent-contaminated areas should keep the following things in mind:

- Clean droppings using a wet method, rather than a dry method such as sweeping or vacuuming. Spray disinfectant, such as dilute bleach, prior to cleaning and use a wet mop or towels moistened with disinfectant to clean.
- Work in well-ventilated areas.
- Gloves, dust mist masks, long-sleeved clothing, and protective eyewear may help prevent exposure.

A *Hantavirus Public Health Fact Sheet* can be obtained from the Division of Epidemiology and Immunization or through the MDPH web site at <<http://www.state.ma.us/dph/>>. Click on the “Publications” link and scroll down to the Fact Sheets section.

ADDITIONAL INFORMATION

The following is the formal CDC surveillance case definition for hantavirus. It is provided for your information only and should not affect the investigation or reporting of a case that fulfills the criteria in Section 2) A of this chapter. (CDC case definitions are used by the state health department and CDC to maintain uniform standards for national reporting.) For reporting a case to the MDPH always use the criteria outlined in Section 2) A.

Clinical case definition

An illness characterized by one or more of the following clinical features:

- A febrile illness (*i.e.*, temperature > 101.0° F [>38.3° C]) characterized by bilateral diffuse interstitial edema that may radiographically resemble ARDS, with respiratory compromise requiring supplemental oxygen, developing within 72 hours of hospitalization, and occurring in a previously healthy person.
- An unexplained respiratory illness resulting in death, with an autopsy examination demonstrating noncardiogenic pulmonary edema without an identifiable cause.

Laboratory criteria for diagnosis

- Detection of hantavirus-specific immunoglobulin M or rising titers of hantavirus-specific immunoglobulin G; or detection of hantavirus-specific ribonucleic acid sequence by polymerase chain reaction in clinical specimens; or detection of hantavirus antigen by immunohistochemistry.

Case classification

Confirmed: a clinically compatible case that is laboratory confirmed. (Laboratory testing should be performed or confirmed at a reference laboratory. Because the clinical illness is nonspecific and ARDS is common, a screening case definition can be used to determine which patients to test. In general, a predisposing medical condition (*e.g.*, chronic pulmonary disease, malignancy, trauma, burn, and surgery) is a more likely cause of ARDS than HPS, and patients who have these underlying conditions and ARDS need not be tested.)

REFERENCES

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